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July 8, 2016

Ms. Glenda Dean  
Alabama Department of Environmental Management  
1400 Coliseum Boulevard  
Montgomery, AL 36110



**RE: Warrior River Fish Kill**

Dear Ms. Dean:

Per your request we are providing information concerning the Bankhead Reservoir fish kill reported on June 16, 2016 ("fish kill"). The requested information is provided in this letter along with attachments. We have laid out the various events as we understand them along with additional requested information obtained by Alabama Power Company (APC).

On Monday, June 13<sup>th</sup>, continuation of an Alabama Department of Transportation bridge project on the Highway 269 Bridge over Baker's Creek was ongoing. We understand this project involved soil disturbing activity in and around the creek bank. Additionally, an accident occurred that day involving a piece of heavy equipment falling into Bakers Creek. We will not speculate as to whether that accident could have led to oil based products or turbid water being released into the creek upstream of the Black Warrior River confluence or whether the fish kill was related to the accident. A review of local weather conditions shows that over 3.5 inches of rain fell between Wednesday, June 15<sup>th</sup> and Thursday, June 16<sup>th</sup>.

Operable generating units at Plant Gorgas are Units 8, 9, and 10. On Thursday, May 26<sup>th</sup>, Plant Gorgas personnel began bringing units offline for a planned outage to complete scheduled maintenance. By Saturday, May 28<sup>th</sup>, all three units were offline. All of the circulating water pumps were taken out of service by Tuesday, May 31<sup>st</sup>. All of the projects completed during this planned outage involved systems and equipment related to air flow and/or steam flow processes which would not affect the water quality of any receiving water body. Additionally, with the units and circulating pumps being offline, the typical thermal loading to the receiving waterbody was not present. The circulating water pumps were returned to service between Friday, June 10<sup>th</sup> and Thursday, June 16<sup>th</sup>. The units were brought online between Thursday, June 16, and Tuesday, June 21<sup>st</sup>.

Water is supplied to Plant Gorgas from the Black Warrior River via an intake canal and the majority is discharged to Bakers Creek. To prevent floating debris from entering the intake canal, a weir has been constructed across the mouth of the intake at its confluence with the Black Warrior River. Plant drawings indicate that the weir extends to a depth of approximately 30 feet below the surface of the water.

On Thursday, June 16<sup>th</sup>, a fish kill was reported on the river, which led the Alabama Department of Conservation and Natural Resources (ADCNR) to respond. ADCNR's report is attached (Appendix A). Based on the condition of the fish, ADCNR indicated the fish kill may have occurred days earlier. Field notes recorded by APC on June 16<sup>th</sup> regarding the decomposed condition of the fish agrees with ADCNR's assumption.

On June 16<sup>th</sup>, and then again on Monday, June 27<sup>th</sup>, APC and ADEM collected water quality data upstream and downstream of Gorgas Steam Plant in both the Black Warrior River and Bakers Creek. Water samples collected by APC on June 16<sup>th</sup> were sent for lab analysis. In addition, temperature and dissolved oxygen (DO) measurements were recorded on-site. On June 27<sup>th</sup>, only temperature and DO were recorded. The results of all APC samples are located in Appendix B.

Data collected on June 16<sup>th</sup> indicated that the DO in the Black Warrior River decreased with depth both upstream and downstream of Plant Gorgas. DO ranged from above 10 mg/L at the surface to below 3mg/L at depths below 20 feet. Bakers Creek is shallow and did not show significant DO variability throughout the water column. The DO was measured near 3.5mg/L at the Plant Gorgas discharge and approximately 6mg/L upstream of the plant. Lab analysis of the additional water quality parameters did not indicate any water quality anomalies. There was no evidence of an ongoing fish kill at the time the measurements were taken. Furthermore, dissolved oxygen requirements were well above those considered lethal for warm water fishes. Noga 2010, states that prolonged dissolved oxygen levels below 2 ppm may be stressful for fish but that many warm water fish tolerate long periods of dissolved oxygen concentrations of 2-3 ppm. Considering that along with the observation of fish exhibiting normal behavior, it is unlikely that dissolved oxygen concentrations measured in the vicinity of Plant Gorgas resulted in the fish kill.

Data collected on June 27<sup>th</sup> indicates the DO variability throughout the water column decreased from June 16<sup>th</sup>. The DO in the Black Warrior River ranged from near 9mg/L at the surface to approximately 6mg/L at a depth of 20 feet. The DO in Bakers Creek again showed minimal variability and was approximately 7mg/L at both the plant discharge and upstream of the plant.

APC is confident that none of its activities were responsible for the fish kill. If you have any further questions or concerns, please contact Mike Godfrey at (205) 257-6131.

Sincerely,



Mike Godfrey  
General Manager – Environmental Affairs

Enclosures (2)  
:JBD

Literature Cited

Noga, E.J. 2010. Fish Disease Diagnosis and Treatment 2<sup>nd</sup> Edition. Wiley-Blackwell. Ames, Iowa.

Appendix A  
ADCNR's Report

## Bankhead Reservoir Fish Kill Investigation

Parrish, Alabama

June 16th, 2016

Christopher McKee

District III Fisheries Biologist

### **Introduction**

On June 16th, 2016 a fish kill was reported to the District III Fisheries Office by angler James Bramlett at Bankhead Reservoir in Walker County near the Gorgas Steam Plant. The cause of the kill has yet to be determined.

### **Calculations**

All fish in the area of the kill were measured and enumerated.

### **Procedures**

At 8:20 AM on June 16<sup>th</sup> a fish kill was reported at the Gorgas Steam Plant on Bankhead Reservoir. Biologist McKee and Aide Cantrell arrived on scene at 10 AM on June 16<sup>th</sup>, 2016. After locating the upper and lower termini of the kill we identified, enumerated, and measured each of the dead fish in the kill area. The sample area included in this report was 26 acres of reservoir, however it was reported that the dead fish were washed out of the Gorgas Steam Plant discharge canal into the Bankhead Reservoir (Figure 1.). Dead fish were found in the discharge canal and no dead fish were found upstream of the discharge canal. Upstream of the discharge canal dissolved oxygen was measured at 9.2 mg/l and the water clarity was normal (Figure 4). In the discharge canal dissolved oxygen was 3.5 mg/l and the water was turbid. Downstream of the canal there was an oily sheen on the water, it was turbid, and the dissolved oxygen was 6.0 mg/l (Figures 2 and 3). Baker Creek flows through the Gorgas Steam Plant and enters the Bankhead Reservoir via the discharge canal. ADCNR biologists and Josh Therrien of ADEM investigated two access points on Baker Creek upstream of the Gorgas Steam Plant and found no dead fish. Dissolved oxygen in Baker Creek upstream of the plant was normal (9.5 m/l), there was no sign of a petroleum spill, and the water was not turbid. Josh Therrien of ADEM obtained water samples from five locations which are currently being processed by ADEM. The number of fish we were able to enumerate was substantially reduced due to a tug boat coming through the kill area causing many of the dead fish to sink.

### Conclusions

1. The exact cause of the fish kill is unknown
2. Employee salary, benefits, per diem, and mileage expenses for investigating this fish kill totaled \$702.88.
3. The total value of the fish and the investigation was \$2,575.21.

Estimated weights of fish involved in the kill were obtained from *Length-Weight Relationships of Alabama Fishes* by Mr. Wayne Swingle, unless otherwise noted. Monetary values and subsampling procedures were obtained from American Fisheries Society Special Publication 30, *Investigation and Monetary Values of Fish and Freshwater Mussel Kills* and reflect an adjustment in the current Producers Price Index.

Table 1. Inch group, number, weight, and monetary value of  
**GIZZARD SHAD**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
6	1	0.08400	0.05
7			
8	1	0.18000	0.11
<b>Total</b>	<b>2</b>	<b>0.26400</b>	<b>\$0.16</b>

Table 2. Inch group, number, weight, and monetary value of  
**SKIPJACK HERRING**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
11			
12	2	1.24000	0.35
13	3	2.34000	0.52
14	2	1.98000	0.35
15	2	2.28000	0.35
16	3	3.87000	0.52
<b>Total</b>	<b>12</b>	<b>11.71000</b>	<b>\$2.09</b>

Table 3. Inch group, number, weight, and monetary value of  
**SPOTTED SUCKER**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
17	1	2.08000	11.24
<b>Total</b>	<b>1</b>	<b>2.08000</b>	<b>\$11.24</b>

Table 4. Inch group, number, weight, and monetary value of  
**BLUE CATFISH**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
4	1	0.01800	0.29
5	1	0.04100	0.38
6	1	0.06200	0.48
<b>Total</b>	<b>3</b>	<b>0.12100</b>	<b>\$1.15</b>

Table 5. Inch group, number, weight, and monetary value of  
**FRESHWATER DRUM**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
1			
2			
3			
4	4	0.08000	1.22
5			
6	1	0.08600	0.31
7	8	1.12000	3.72
8	4	0.76000	1.86
9	7	2.03000	4.58
10	3	1.20000	1.96
11	3	1.62000	2.31
12	3	2.07000	2.70
13	1	0.92000	1.10
14	1	1.19000	1.42
<b>Total</b>	<b>35</b>	<b>11.07600</b>	<b>\$21.17</b>

Table 6. Inch group, number, weight, and monetary value of  
**STRIPED BASS**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
1			
2			
3			
4			
5	1	0.05560	2.12
6	3	0.28859	6.80
7	4	0.61169	16.97
8	7	1.59939	29.70
9	2	0.65118	10.71
10	6	2.68173	44.11
11	4	2.38118	39.16
12	2	1.54665	25.44
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24	1	6.21669	102.25
25			
26	1	7.90840	130.08
27			
28			
29	1	10.98233	180.63
30			
31			
32	1	14.76556	242.86
33			
34	2	35.43651	582.85
35	1	19.33198	317.97
36			
<b>Total</b>	<b>36</b>	<b>104.45748</b>	<b>\$1,731.65</b>



Table 7. Inch group, number, weight, and monetary value of  
**HYBRID STRIPED BASS**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
11	1	0.6617	10.88
<b>Total</b>	<b>1</b>	<b>0.6617</b>	<b>\$10.88</b>

Table 8. Inch group, number, weight, and monetary value of  
**YELLOW BASS**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
8	1	0.28000	2.06
<b>Total</b>	<b>1</b>	<b>0.28000</b>	<b>\$2.06</b>

Table 9. Inch group, number, weight, and monetary value of  
**LARGEMOUTH BASS**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
21	2	11.12000	87.89
<b>Total</b>	<b>2</b>	<b>11.12000</b>	<b>\$87.89</b>

Table 10. Inch group, number, weight, and monetary value of  
**BLUEGILL**  
killed in Bankhead Reservoir, Walker County, on June 16, 2016.

Inch Group	Number	Weight (lbs.)	Value
5	1	0.08100	\$0.70
6			
7			
8	1	0.35000	\$2.99
<b>Total</b>	<b>2</b>	<b>0.43100</b>	<b>\$3.69</b>



Figure 1. Map of the Bankhead Reservoir Fish Kill, Walker County June 16<sup>th</sup> 2016.



Figure 2. Bankhead Reservoir Fish Kill, Walker County June 16<sup>th</sup> 2016.



Figure 3. Oil sheen in the area of the Bankhead Reservoir Fish Kill, Walker County June 16<sup>th</sup> 2016.



Figure 4. Turbid water entering Bankhead Reservoir from the Gorgas Steam Plant Discharge Canal, Walker County June 16<sup>th</sup> 2016.

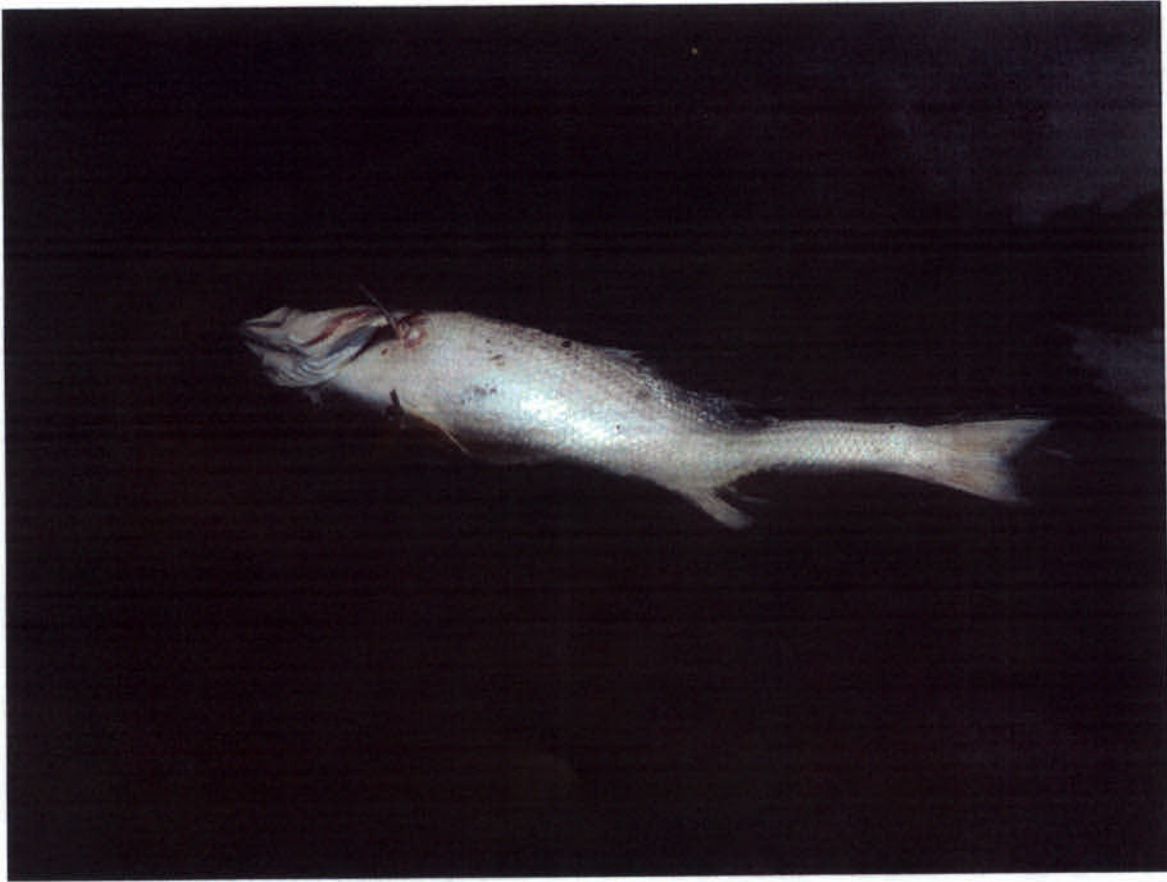


Figure 2. Dead Striped Bass at the Bankhead Reservoir Fish Kill, Walker County June 16<sup>th</sup> 2016

Appendix B  
Alabama Power Company's Water Sampling Results



**Dissolved Oxygen Data  
Warrior River Near Gorgas Steam Plant  
June 16th, 2016**

Upstream of Gorgas - Mid channel near intake		
Depth (ft)	Temperature (C)	D.O. (ppm)
0	29.8	10.58
3	29.4	10.45
5	28.5	9.46
10	27.5	5.15
15	26.9	3.84
20	26.4	3.02
25	26.2	3.11

Bottom depth 27 ft.

Baker's Creek - Upstream of Gorgas Discharge		
Depth (ft)	Temperature (C)	D.O. (ppm)
0	28.6	6.18
5	28.4	5.95

Gorgas Discharge		
Depth (ft)	Temperature (C)	D.O. (ppm)
0	28	3.48
3	28.2	3.46

Bottom depth 6 ft.

Downstream of Gorgas Discharge mid-channel		
Depth (ft)	Temperature (C)	D.O. (ppm)
0	29.4	7.81
3	28.6	6.3
5	28.2	5.83
10	27.1	3.85
15	26.9	3.79
20	26.4	3.03
30	25.8	2.38

Downstream of Gorgas Discharge left ascending bank		
Depth (ft)	Temperature (C)	D.O. (ppm)
0	28.6	4.65
3	28.4	4.47
5	28.4	4.28
10	28.8	3.51

Downstream of Gorgas Discharge approximately 1.2 miles mid-channel		
Depth (ft)	Temperature (C)	D.O. (ppm)
0	29.2	10.08
3	28.2	8.87
5	27.9	6.71
10	27.3	4.8
15	26.8	4.54
20	25.9	2.59
30	24.5	0.55

Bottom depth 38 ft.

**Dissolved Oxygen Data  
Warrior River Near Gorgas Steam Plant  
June 27th, 2016**

Upstream of Gorgas - Mid channel near intake				
Depth (ft)	Temperature (C)	D.O. (ppm)	Time	
0	31.9	9.14	1218	N33.64566
3	30.26	9.19	1218	W087.18627
5	29.2	7.63	1219	
10	28.4	6.71	1219	
15	27.7	6.55	1219	
20	25.3	6.59	1220	
30	20.9	6.4	1221	
			1222	

Baker's Creek - at Gorgas Discharge				
Depth (ft)	Temperature (C)	D.O. (ppm)	Time	
0	30.4	7.05	1243	N33.64456
3	29.3	6.9	1243	W087.19774
5	29.6	6.82	1244	

Boat ramp in Baker's Creek				
Depth (ft)	Temperature (C)	D.O. (ppm)	Time	
0	29.7	7.06	1236	N33.64264
3	29.9	6.98	1237	W087.19922
5	29.9	6.94	1237	
10	30.1	6.98	1238	

Downstream of Gorgas Discharge mid-channel				
Depth (ft)	Temperature (C)	D.O. (ppm)	Time	
0	29.9	7.24	1224	N33.64238
3	29.9	7.05	1225	W087.20164
5	29.6	6.96	1226	
10	28.9	6.96	1227	
15	28	6.94	1227	
20	25.6	6.31	1228	
30	20.6	5.34	1229	
40	20	5.26	1230	



Downstream of Gorgas Discharge approximately 1.2 miles mid-channel				
Depth (ft)	Temperature (C)	D.O. (ppm)	Time	
0	32.4	9.96	1300	N33.64590
3	32.1	10.03	1305	W087.21789
5	31	9.62	1308	
10	29.4	8.06	1309	
15	28	6.9	1309	
20	25.1	5.99	1310	
30	20.9	4.82	1311	

AW15241 Warrior River - Just Downstream of Discharge (Gorgas SP)							
Date	H2O Temp °C	pH S.U.	TSS mg/L	Alkalinity mg/L	CBOD-5 mg/L	D.O. mg/L	
6/16/2016	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	

AW15241 Warrior River - Just Downstream of Discharge (Gorgas SP)							
Date	NH3-N mg/L	NO3+NO2-N mg/L	Total-P mg/L	COD mg/L	As mg/L	Cu mg/L	
6/16/2016	0.11	0.31	Not Measured	Not Measured	< 0.005	0.001 (J)	

AW15241 Warrior River - Just Downstream of Discharge (Gorgas SP)							
Date	Fe mg/L	Cr mg/L	Ni mg/L	Zn mg/L	Se mg/L	Cd mg/L	
6/16/2016	0.217	< 0.001	< 0.002	0.024	0.009 (J)	< 0.001	

AW15241 Warrior River - Just Downstream of Discharge (Gorgas SP)							
Date	Ag mg/L	Sb mg/L	Tl mg/L	Pb mg/L	Al mg/L	Mn mg/L	
6/16/2016	< 0.001	< 0.004	< 0.010	< 0.011	0.897	0.313	

(J) Estimate - value between MDL and RL

AW15242 Gorgas Discharge Above Gate							
Date	H2O Temp °C	pH S.U.	TSS mg/L	Alkalinity mg/L	CBOD-5 mg/L	D.O. mg/L	
6/16/2016	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured

AW15242 Gorgas Discharge Above Gate							
Date	NH3-N mg/L	NO3+NO2-N mg/L	Total-P mg/L	COD mg/L	As mg/L	Cu mg/L	
6/16/2016	0.1	< 0.05	Not Measured	Not Measured	< 0.005	0.001 (J)	

AW15242 Gorgas Discharge Above Gate							
Date	Fe mg/L	Cr mg/L	Ni mg/L	Zn mg/L	Se mg/L	Cd mg/L	
6/16/2016	0.328	< 0.001	< 0.002	0.012	0.012 (J)	< 0.001	

AW15242 Gorgas Discharge Above Gate							
Date	Ag mg/L	Sb mg/L	Tl mg/L	Pb mg/L	Al mg/L	Mn mg/L	
6/16/2016	< 0.001	< 0.004	< 0.010	< 0.011	0.614	0.289	

(J) Estimate - value between MDL and RL